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THE IMMATURE STAGES OF SOME BRITISH ANTHOCORIDAE (HEMIPTERA)

By W. A. Sands.

Manuscript received 20th February, 1957.

(Read 1st May, 1957).

(With 5 Text-figures)

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I. Introduction.

The life histories of a few of the British species of Anthocoridae have already been studied, but the majority are still unknown. Those described in this paper comprise about half the known British species, and are those which are common in the vicinity of the Imperial College Field Station, Silwood Park, near Ascot, in Berkshire. They are as follows :—

Anthocorinae	*Anthocoris nemorum* (L.)
	Anthocoris nemoralis (Fabricius)
	Anthocoris sarothamni (Douglas and Scott)
	Anthocoris gallarum-ulmi (Degeer)
	Anthocoris confusus (Reuter)
	Orius majusculus (Reuter)
	Orius niger (Wolff)
	Acompocoris pygmaeus (Fallén)
	Elatophilus nigricornis (Zetterstedt)
Dufouriellinae	*Cardiastethes fascii-ventris* (Garbiglietti)
Lyctocorinae	*Xylocoris cursitans* (Fallén)
	Lyctocoris campestris (Fabricius)

II. Methods and Material.

Wherever possible the insects were reared from egg to adult in the laboratory, and the dating of life histories correlated with field observations. Drawings and measurements were made from live or freshly killed material throughout.

III. Structure.

Ova.—The eggs of Anthocoridae are described by Southwood (1956) as elongate with a pale chorion, often clearly showing the hexagonal pattern of the follicular cells of the ovary on their surface. The operculum is almost circular and the follicular pits form a pattern, consisting of a single outer ring, with thicker walls surrounding a central area of thinner reticulated ridges. The surface of the operculum within the pits of the central area has finely reticulated markings. Surrounding the operculum is a rim formed by the edge of the chorion. The peripheral part of this is the network region of Southwood (1956), which varies considerably in its degree of development. *Elatophilus nigricornis* is exceptional among the species considered in that the operculum is broad oval and only bilaterally symmetrical.

Nymphs.—The nymphs of Anthocoridae are oval in outline. The rostrum has three and the antennae four segments. They are largely predatory in habit, but have occasionally been observed to feed on plant juices.

IV. Anthocorinae

Anthocoris nemorum (Linn.) (Figs. 1, A ; 3, A ; 4, A).

One of the commonest species of the genus, this was studied by Peska (1932) and Southwood & Scudder (1956), who illustrated the immature stages. It is found on a large range of plant species, and has a wide geographical distribution.

Development from egg to adult takes approximately five weeks. The egg hatches after about seven days, and the first instar lasts five days. The second to fifth instars last five to seven days each. The adult requires a period of about three weeks for maturation before oviposition can take place, and the entire life cycle occupies approximately eight weeks.

Oviposition.—The egg is usually laid in the leaf tissue just beneath the epidermis, which is domed out over it and through which only the operculum protrudes. The eggs are frequently laid in small groups of from 2–8, often near the leaf edge or apex, or a break in the surface due to insect or other damage.

Ova.—Length 0·82–0·84 mm. Outer ring of follicular pits of operculum about one quarter of entire radius, peripheral rim of chorion narrow, more or less erect.

Nymphs.—First instar : length 1·3 mm., mainly bright red when first hatched, cuticle becoming slightly dusky towards end of instar ; legs, rostrum, and first three segments of antennae pale yellow ; head, apical segment of antennae, pronotum, and abdomen, red ; mesonotum yellow, metanotum yellowish-white. *Second instar :* similar, length 1·8 mm., pale region of thorax confined to lateral parts of meso- and metanota. *Third* and *fourth instars :* pigmentation of fifth instar developing, pale coloured region of thorax increasingly confined to wing rudiments. Lengths 2·5 mm. and 3·0 mm. respectively. *Fifth instar :* length 4·1 mm., ground colour variable, reddish-brown to deep greenish-brown, apparently to some extent correlated with plant on which development takes place, specimens from Broom (*Sarothamnus scoparius* (L.)) being darker than most others. Occasionally parts of abdominal cuticle retain red coloration of earlier instars. Rostrum, head, most of thorax, and abdomen, of ground colour ; posterior angles of pronotum and apical halves of wing rudiments paler ; pale region of wing rudiments usually yellowish-white, but variable in extent, sometimes only slightly paler than ground colour ; antennae, segments I and IV dark, IV reddish at tip, II and III pale, dusky at base and apex ; tibiae dark at base, distal two-thirds pale, tarsi dusky. Pubescence largely confined to antennae, legs and tip of abdomen. General appearance of this species characteristically glossy compared to other members of the genus.

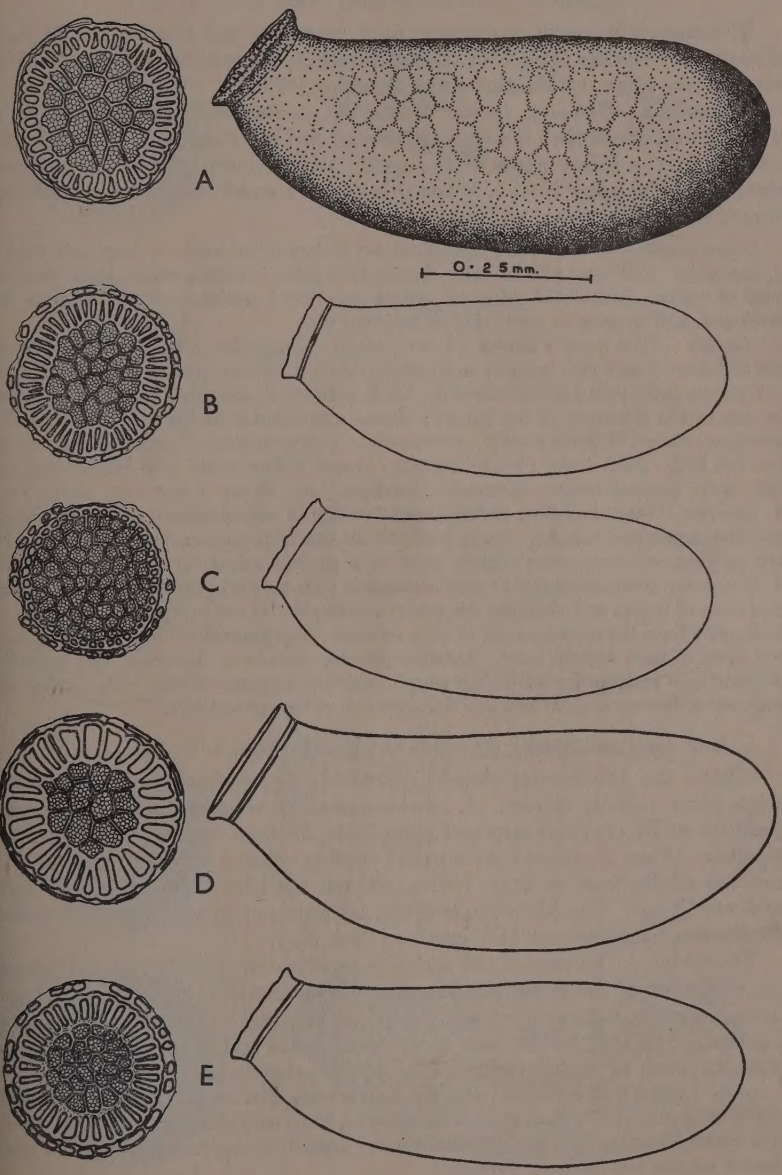

FIG. 1.—Side views of ova with surface views of opercula of some British Anthocoridae (scale applies to side views only): (A) *Anthocoris nemorum* (L); (B) *A. nemoralis* (Fabr.); (C) *A. sarothamni* (Douglas & Scott); (D) *A.g-ulmi* (Degeer); (E) *A. confusus* (Reuter).

Anthocoris nemoralis (Fabr.) (Figs. 1, B ; 4, B).

This species is almost as common as *A. nemorum*, and also has a wide range of habitats. The life cycle is of similar duration. Certain measurements of the nymphs are given by Southwood & Scudder (1956).

Oviposition.—The egg laying habits of *A. nemoralis* resemble those of *A. nemorum* except that the eggs are seldom laid in groups, and are sometimes inserted in the softer parts of the stems and petioles, which has not been observed in the latter species. When this occurs a small corky gall is sometimes formed around the egg.

Ova.—Length 0·63–0·64 mm., operculum set at less of an angle to long axis than in *A. nemorum*. Follicular pits of outer ring more regular in arrangement, more than one third of radius ; reticulated ridges of central area finer ; peripheral rim of chorion well developed, half as wide as outer ring of follicular pits.

Nymphs.—First instar : length 1·1 mm., mainly clear yellow ; head, tips of antennae and abdomen tinged with orange ; legs slightly dusky ; posterior margins of second, third, and fourth abdominal tergites narrowly black between openings of dorsal scent glands, because of the thickness of the cuticle ; dorsal scent glands darker orange than rest of abdomen. *Second to fourth instars :* intermediate in development of pigmentation between first and fifth. *Fifth instar :* length 4·0 mm., ground colour varies from reddish-brown to very deep greenish-brown, specimens developing on Broom being very dark, as in *A. nemorum* ; head, including rostrum, most of thorax and abdomen, of ground colour ; posterior angles and variable area of posterior margin of pronotum, pale ; apical third to half of wing rudiments from slightly paler than ground colour, to almost as pale as in *A. nemorum* ; posterior angles of each abdominal segment also paler than ground colour ; pale areas of thorax and abdomen frequently less distinct in the earlier instars ; antennae dark apart from the extreme apex of each segment ; legs generally dusky, apices of tibiae and bases of tarsi slightly paler. Antennae shorter than in *A. nemorum*, only extending beyond tip of rostrum for about half length of apical segment. Entire body surface with scattered pubescence, more strongly developed on antennae and legs.

Anthocoris sarothamni (Douglas and Scott) (Figs. 1, C ; 3, B ; 4, D).

Unlike the two species already described, *A. sarothamni* is confined to a single plant, namely Broom. *A. nemorum* amd *A. nemoralis* also occur in large numbers on Broom, and eggs and nymphs of all three species have been found together. When *A. sarothamni* is caged on other plants, oviposition takes place and the adults feed on these plants, though nymphs were not reared under such conditions. The life cycle is of similar duration to the other two species. First instar nymphs were first found on 24th May.

Oviposition. The eggs of the spring generation are usually inserted beneath the epidermis of the stems, in the softer tissues between the ribs, which give them protection from rubbing against adjoining stems ; they are rarely grouped together. The eggs of the summer generation are laid in a greater variety of positions, such as on the young leaves and developing seed pods.

Ova.—Length 0·63–0·64 mm., slightly stouter than that of *A. memoralis*. Follicular pits of outer ring smaller than those of central area, being only one-eighth of radius. Central area slightly convex, follicular pits with thinner walls than outer ring. Peripheral rim of chorion present but unevenly developed.

Nymphs.—First instar : length 1·0 mm., apical segments of antennae and abdomen orange ; thorax pale orange-yellow ; antennal segments one to three, rostrum and legs pale yellow ; posterior margins of abdominal tergites two to four narrowly black between openings of dorsal scent glands, which are deep orange. *Instars two to four :* intermediate

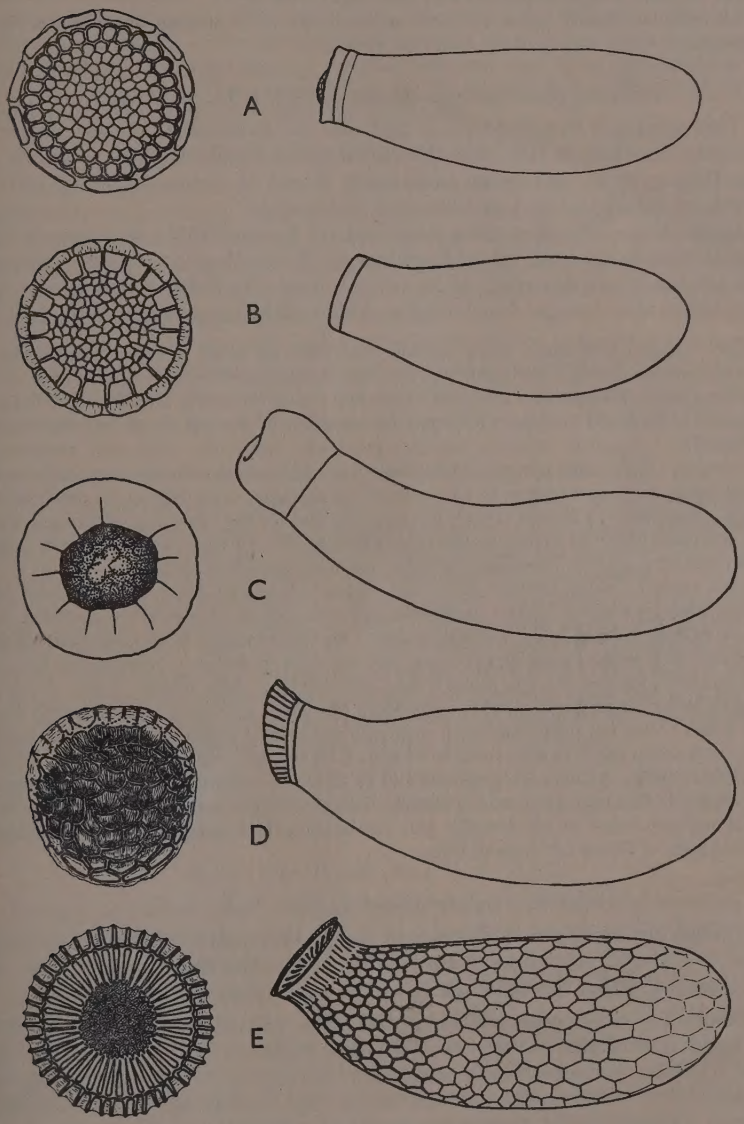

FIG. 2.—Side views of ova with surface views of opercula of some British Anthocoridae: (A) *Orius majusculus* (Reuter); (B) *O. niger* (Wolff); (C) *Acompocoris pygmaeus* (Fallén); (D) *Elatophilus nigricornis* (Zett.); (E) *Xylocoris cursitans* (Fallén).

in coloration between first and fifth. *Fifth instar :* length 3·4–3·5 mm., dark olive-brown to greenish-black, first two abdominal tergites, apices of antennal segments one to three, base of segment four, and apices of leg joints, slightly paler.

All nymphs sparsely pubescent, with a few longer setae at sides of body and tip of abdomen.

Anthocoris gallarum-ulmi (Degeer) (Figs. 1, D ; 3, C ; 4, E).

This species is locally common and, like *A. sarothamni*, is restricted to a particular habitat, in this case the curled-up leaf galls caused by aphids on Elm (*Ulmus* sp.) ; it is also occasionally found in similar types of gall on Hawthorn (*Crataegus* sp.) and Currant (*Ribes* sp.).

Oviposition.—The eggs were described by Leston (1954), who noted that they are laid in the main rib of large leaves. They are also frequently inserted beneath the upper epidermis of leaves only partially deformed by new aphid galls, before they become discoloured and filled with the secretions of the aphids.

Ova.—Length 0·85 mm., much stouter than those of other species ; sculpturing of operculum much coarser. Follicular pits of outer ring number 25–30, compared with 40–50 in other species, at least half radius of operculum ; pits of central area 12–15 in number compared with 20–30 in related forms. Peripheral rim of chorion erect, but not strongly developed.

Nymphs.—The young nymphs on hatching enter the gall, and development takes place within, apart from movements to new galls when the older ones dry up on death of the aphids. According to Reuter (1884), the nymphs feed on the secretions of the aphid but they were also observed to feed on the aphids themselves. In view of the predatory habits of the rest of the group, these are probably the main source of food.

First instar : length 1·6 mm., head and thorax pale yellow, head slightly darker than thorax, rostrum slightly dusky ; antennae and legs entirely pale yellow ; abdomen pale orange, with dorsal scent glands slightly darker ; posterior margins of all abdominal tergites narrowly black owing to folding of cuticle. *Second to fourth instars :* intermediate between first and fifth, lengths 2·0, 2·6, and 3·5 mm. respectively. *Fifth instar :* length 4·6 mm., purplish-brown to castaneous brown, immature specimens reddish-brown darkening later. Two forms occur, the commoner with distinctly paler wing rudiments, pale area varying from small apical patch to almost entire wing pad. When wing rudiments not paler, general coloration darker. Antennae, segments I and IV dark ; II and base of III sometimes pale ; in dark form, II dusky at apex, III entirely dark ; abdomen uniformly coloured or with lateral margins more or less broadly pale red-brown ; legs generally dusky, sometimes paler at apex of femur and base of tibia.

Anthocoris confusus (Reuter) (Figs. 1, E ; 4, C).

Though occurring on a wide range of plants, this species was most commonly found on Oak (*Quercus* sp.) and Hawthorn. It was also found on Elm, but was not observed within the aphid galls. It was not found on Broom.

Oviposition.—The eggs are laid in the stems or petioles, or occasionally in the main ribs of the leaves ; they are sometimes even inserted under thin bark, a habit not observed in its congeners. In contrast to the rest of the genus, the eggs of *A. confusus* are not laid in the leaf lamina, and are more deeply inserted into the tissues, though not as deeply as in *Orius*.

Ova.—Length 0·75 mm. ; operculum similar to *A. nemorum* and *A. nemoralis*, but follicular pits of outer ring rather larger and shallower on inner side ; pits of central area somewhat smaller ; peripheral rim of chorion usually erect.

Nymphs.—First instar : pale yellow apart from head, abdomen, and tips of antennae which are pale orange ; dorsal scent glands orange. *Second to fourth instars :* intermediate between first and fifth. *Fifth instar :* ground colour red-brown to deep olive-brown, specimens from Oak usually lighter, those from Hawthorn more often dark. Tips of wing rudiments, and lateral borders of abdominal segments often slightly paler than rest of body ; antennae : segment I dark, II dusky at base and apex, or in paler specimens at apex only ; III, basal half pale, apical half, dark ; IV, entirely dark. Legs entirely dusky brown. Dimensions of nymphs similar to *A. sarothamni.*

Orius majusculus (Reuter) (Figs. 2, A ; 3, D ; 4, F).

Though the commonest British member of the genus, only the adult and egg have been described, the former by Reuter, the latter by Collyer (1950). It is recorded from a wide range of plant species. The duration of development from egg to adult has not been accurately determined, but appears to be longer than in *Anthocoris* species, requiring from six to eight weeks. The entire life cycle probably takes approximately 10 weeks.

Oviposition.—The eggs are laid in the larger ribs or petioles of the leaves, and in the smaller stems. They are inserted almost vertically, except where the tissues beneath the epidermis are too hard, the operculum being almost tangential to the surface of the stem. If eggs are laid in the leaf lamina, as sometimes occurs in captivity, they are pushed straight through, so that the operculum protrudes on one side, the rest of the egg on the other.

Ova.—Length 0·58 mm. Much straighter than in *Anthocoris*, operculum almost at right angles to longitudinal axis. Follicular pits of outer ring nearly circular, thinner walled than in *Anthocoris*. Central area convex, follicular pits small and numerous, thin walled. Peripheral rim of chorion well developed, erect with large thickened patches.

Nymphs.—First and second instars : yellowish-white ; eyes red ; dorsal scent glands orange ; posterior margins of abdominal tergites very narrowly black ; lengths 0·85 and 1·05 mm. respectively. *Third and fourth instars :* dorsal surface becomes slightly dusky, otherwise as first and second ; lengths 1·4 and 2·0 mm. respectively. *Fifth instar :* length 2·7 mm., ground colour dusky-brown ; antennae and legs, pale yellow-brown, darker at tips ; apices of wing rudiments, black ; dorsal eclosion line distinct ; first two tergites of abdomen and sometimes patches on other tergites, pale, yellow-brown.

Nymphs of *Orius* are broader in proportion to length than those of *Anthocoris*, with shorter antennae and rostrum, the antennae reaching to the tip of the rostrum when extended.

Orius niger (Wolff) (Figs. 2, B ; 4, G.)

O. niger occurs on a fairly wide range of plants, but these observations are confined to specimens collected and reared on *Erica cinerea.* The biology of the species has not been described before.

Oviposition.—As in the previous species, the eggs are inserted almost vertically into the plant tissues, with the operculum approximately tangential to the surface. In captivity a few eggs were laid in soft tissues near the apices of stems, and some were pushed through the flowers, but the majority were inserted in the ovary of the flowers in small groups round the base of the style, and it appears likely that this is the usual oviposition site in nature.

Ova.—Slightly shorter and broader than in *O. majusculus*, operculum set more at an angle to longitudinal axis. Follicular pits of outer ring of operculum very large, almost square, less numerous than in *O. majusculus* ; central area strongly convex, follicular pits

small, numerous, less distinct in middle of operculum owing to general thickening. Peripheral rim of chorion regularly thickened, curved forwards and inwards over operculum, forming a rudimentary hood-like structure.

Nymphs.—Earlier nymphs : mainly pale yellowish-orange, abdomen slightly darker, eyes and dorsal abdominal scent glands, red. In third instar, antennae, rostrum and tarsi become slightly dusky. *Fifth instar :* length 2·1 mm., colour as earlier stages, but with increased dusky pigmentation of head, thorax and abdomen, and with extreme tips of wing rudiments darker. Eyes dark red, second segment of antennae with small subapical red patch, due to colour of contents ; dorsal scent glands of abdomen red-brown.

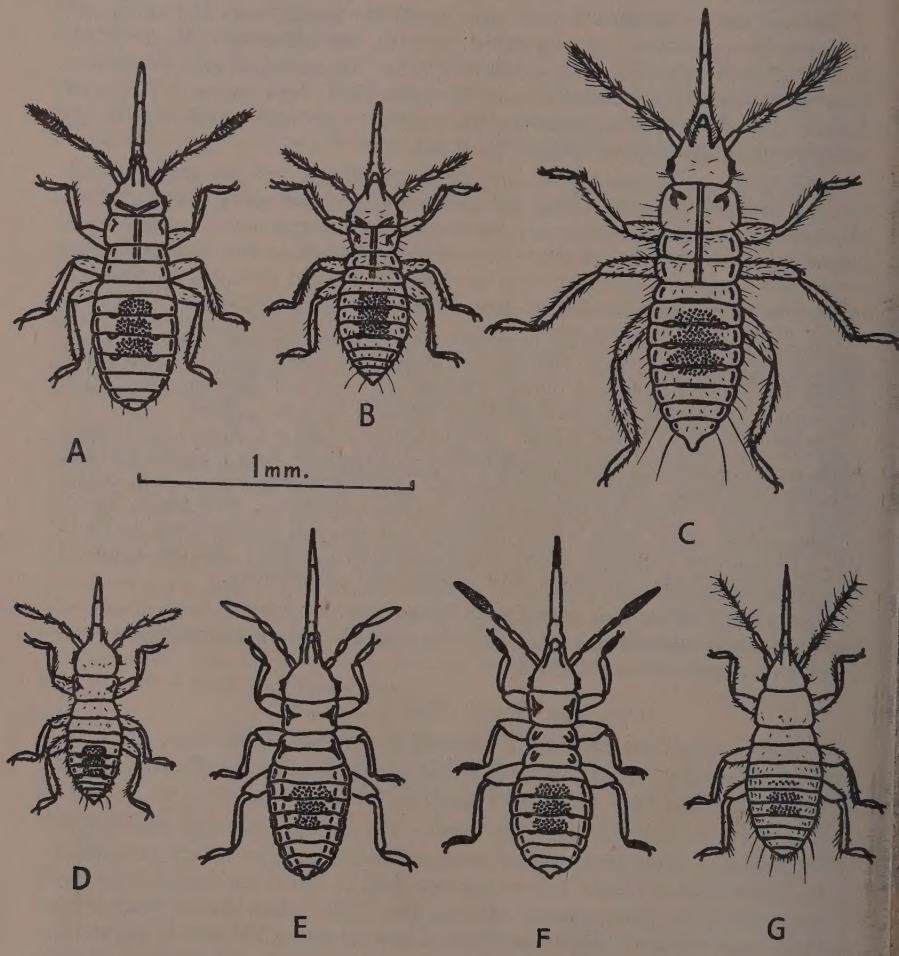

Fig. 3.—First instar nymphs of some British Anthocoridae : (A) *Anthocoris nemorum* (L) ; (B) *A. sarothamni* (Douglas & Scott) ; (C) *A. g-ulmi* (Degeer) ; (D) *Orius majusculus* (Reuter) ; (E) *Acompocoris pygmaeus* (Fallén) ; (F) *Elatophilus nigricornis* (Zett.) ; (G) *Xylocoris cursitans* (Fallén).

Acompocoris pygmaeus (Fallén) (Figs. 2, C ; 3, E ; 5, A).

This species inhabits coniferous trees, and is commonest on *Pinus sylvestris*. Though widely distributed, it is not often abundant.

Development from egg to adult takes approximately five weeks, as in *Anthocoris*, but the egg takes about 14 days to hatch instead of 7, and the nymphal instars are of shorter duration. The maturation period of the adult is about 10 days, and the entire cycle therefore takes six to seven weeks.

Oviposition.—The eggs are most frequently laid in the young needles clustered closely round the stem apex, in both surfaces, though more often on the rounded outer surface. The ovipositor of the female is used to prise the epidermal cells apart rather than to make a definite incision. The strong curvature of the eggs enables them to be pushed deep into the leaf tissues, leaving only the operculum protruding, without producing the bump on the surface of the leaf commonly seen in *Anthocoris* spp.

Ova.—Length 0·75 mm., a regularly curved cylinder, only slightly thickened at opposite end to operculum, which is transverse to longitudinal axis. Operculum of same diameter as egg, which does not taper to a neck as in most other Anthocoridae. Peripheral rim of chorion much enlarged and curved forwards and inwards, forming a hood-like structure which completely hides surface of operculum. Follicular pits of outer ring large and elongate, central area modified to form a small pillar-like protrusion from centre of operculum, somewhat lobed at apex, without distinct follicular pits. On hatching, the hoodlike rim of the chorion may be left attached to the egg, but more frequently the entire structure is pushed off by the emerging nymph, the fracture occurring at the slight constriction behind the operculum.

Nymphs.—First instar : length 1·3 mm., pinkish-orange, thorax slightly paler than head and abdomen ; legs, antennae and rostrum yellowish-white, darkening towards end of instar ; dorsal scent glands of abdomen small, bright red, rostrum longer than antennae by length of apical segment ; antennae, segment IV thickened, equal in length to II and III combined ; abdomen wedge shaped, widest at first segment. *Other instars :* intermediate between first and fifth. *Fifth instar :* length 3·6 mm., yellow-brown to chestnut-brown, extreme tips of wing rudiments dusky-brown to black ; antennae and legs dusky ; rostrum darker, pitchy-brown, longer than antennae by length of apical segment ; antennal segment II almost equal to III and IV combined, IV shorter than III and slightly thinner.

Elatophilus nigricornis (Zetterstedt) (Figs. 2, D ; 3, F ; 5, B).

Though fairly widely distributed, this species is less common than *Acompocoris pygmaeus*. In the course of the present work it was found only on Scots Pine (*Pinus sylvestris*), and was observed to feed only on the aphids, unlike *A. pygmaeus* which also fed readily on other small members of the Pine tree fauna.

The development appears to be of similar duration to *A. pygmaeus*, though the eggs hatched in only seven to eight days.

Oviposition.—The eggs are usually laid in the young needles surrounding the stem apex. Unlike *Acompocoris*, a small semi-circular incision is made and a small flap of epidermis raised, beneath which the egg is inserted deeply in the leaf tissue. The operculum protrudes at right angles to the leaf surface and is hidden from above by the flap of epidermis, so that the egg is very inconspicuous. The depth of insertion prevents the formation of a swelling in the epidermis.

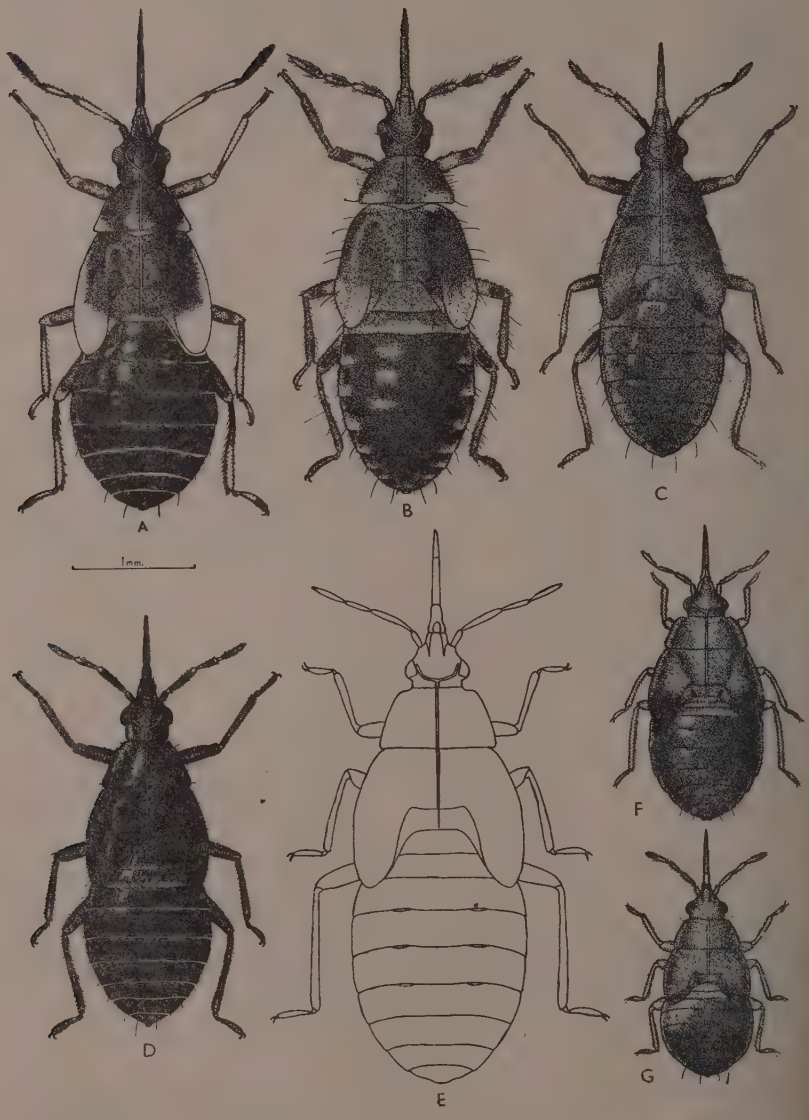

Fig. 4.—Fifth instar nymphs of some British Anthocoridae : (A) *Anthocoris nemorum* (L) ; (B) *A. nemoralis* (Fabr.) ; (C) *A. confusus* (Reuter) ; (D) *A. sarothamni* (Douglas & Scott) ; (E) *A. g-ulmi* (Degeer) ; (F) *Orius majusculus* (Reuter) ; (G) *O. niger* (Wolff).

Ova.—Length 0·72 mm., shape similar to *Anthocoris* spp., though with longer, thinner neck. Symmetry of operculum imperfectly bilateral rather than radial. Follicular pits not separated into outer ring and central area, very deep, resembling a distorted honeycomb with cells leading obliquely downwards to surface of operculum. Peripheral rim of chorion well developed only on the dorsal side.

Nymphs.—Strongly flattened dorso-ventrally like the adult, and cryptic in their habits when not feeding, frequently hiding between the needles or closely pressed to the stem.

First instar: length 1·25 mm., pale yellow; tips of antennae, rostrum, and tarsi dusky; dorsal scent glands of abdomen orange; rostrum longer than antennae by half length of apical segment; apical segment of antennae equal in length to II and III, thickened to a tapering club; posterior corners of meso- and meta-nota slightly lobed in position where wing rudiments develop in later instars; abdomen broad, oval in outline, widest at segment 3–4 (c.f. *Acompocoris pygmaeus*). *Fifth instar:* length 3·3 mm., generally dark olive-brown, antennae and rostrum pitchy black, legs pale yellow-brown clouded with darker brown; posterior margins of first and second abdominal segments narrowly white, lateral margins often slightly paler than ground colour, dorsal scent glands almost obscured, orange. Antennae slightly longer than rostrum, segment II almost equal in length to III and IV combined, IV not markedly thickened, slightly longer than III; abdomen broad oval, almost circular in outline, broadest at fourth segment. *Second to fourth instars:* intermediate between first and fifth.

V. Dufouriellinae.

Cardiastethes fascii-ventris (Garbiglietti) (Fig. 5, C).

Though it has been recorded from a number of other trees and herbs, this uncommon species was found only on Scots Pine in the course of the present work. First instars taken in the field reached the fifth instar in approximately three weeks, and development from hatching to adult therefore probably occupies about five weeks.

Ova.—Unknown.

Nymphs.—First instar: length 1·0 mm.; blood red, but rostrum, antennae and legs pale yellow; segments III and IV of antennae slightly thinner than I and II; rostrum short, barely reaching coxae of mesothorax when reflexed. *Second to fourth instars:* intermediate between first and fifth. *Fifth instar:* length 2·4 mm.; head, thorax, and abdomen deep blood red, colour of body contents seen through colourless or slightly pigmented cuticle; rostrum, antennae and legs mainly pale yellow; bases of rostrum and femora, apex of antennal segment II, and whole of III and IV, slightly dusky; wing rudiments slightly darker at tips; antennal segments III and IV slightly thinner than I and II, though less so than in Lyctocorinae.

VI. Lyctocorinae.

Xylocoris cursitans (Fallén) (Figs. 2, E; 3, G; 5, D).

This species is common under the bark of dead and decaying logs, particularly of Beech (*Fagus sylvatica* (L.)). It has also been recorded in granaries and similar situations, and the macropterous form is sometimes found on plants in the open. When found in the sub-cortical habitat, it is commonest where the wood is still firm, only thinly covered with a fungal mycelium, and slightly damp. Wetter or drier conditions seem to be less favourable. In suitable situations, small groups of nymphs and adults may be found together, often with the empty cuticles of Collembola and Thysanoptera, suggesting at least a partly predatory habit.

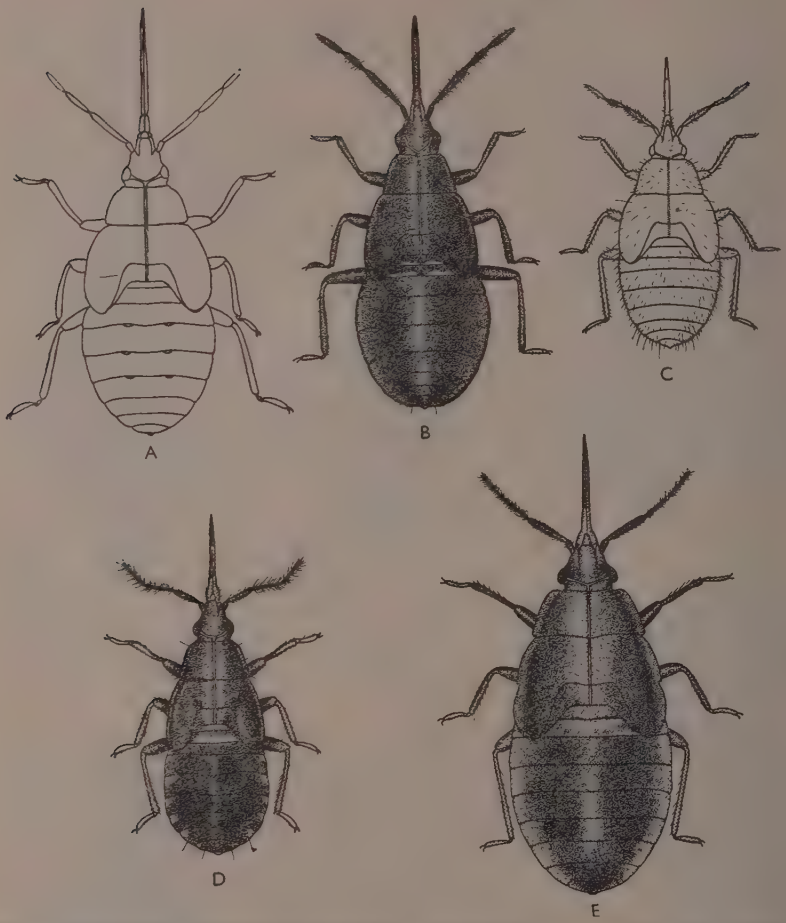

FIG. 5.—Fifth instar nymphs of some British Anthocoridae: (A) *Acompocoris pygmaeus* (Fallén); (B) *Elatophilus nigricornis* (Zett.); (C) *Cardiastethes fascii-ventris* (Garbiglietti); (D) *Xylocoris cursitans* (Fallén); (E) *Lyctocoris campestris* (Fabr.).

Brachypterous adults and nymphs of all instars were found under bark in early spring, and the life cycle is therefore probably continuous, being interrupted only by lowered temperatures.

Oviposition.—The eggs are laid singly in the soft decayed corky material between the medullary rays on the inside of the bark and are inserted parallel to the surface, with only the operculum protruding obliquely, as are those of Anthocorinae in living plants.

Ova.—Similar in shape to those of Anthocorinae, but chorion entirely covered with polygonal reticulated sculpturing, more strongly developed at opercular end, where the follicular pits have striated sides. These do not always correspond perfectly to the markings on the chorion left by the follicular cells, common to the whole family; this suggests that

they are secreted at a late stage of development, when the egg may have moved slightly.

Operculum characteristic, follicular pits of outer ring elongate, those of central area very small. Peripheral rim of chorion broad, and thickened in narrow radial bands, as in *Xylocoris flavipes* Reuter (Southwood, 1956).

Nymphs.—First instar : length 1·1 mm. ; bright scarlet, but legs, antennae and rostrum pale yellow ; dorsal abdominal scent glands poorly developed, deeper red ; head, thorax and abdomen together elliptical ; antennal segments III and IV very thin, clothed with long erect setae, antennae slightly longer than extended rostrum up to third instar ; rest of body with a few long setae, otherwise glabrous. *Second to fourth instars :* intermediate in appearance between first and fifth, lengths 1·4, 1·8, and 2·3 mm. respectively. *Fifth instar :* length 2·9 mm. ; deep dusky red, owing to darkening of cuticle, but anterior corners of abdominal segments slightly paler, and rostrum, antennae and legs pale yellow ; head, thorax and abdomen together broadly elliptical ; antennae about as long as extended rostrum, segments III and IV very thin and with numerous long erect setae.

Lyctocoris campestris (Fabricus) (Fig. 5, E).

This species inhabits soiled hay or straw stacks, bird and mammalian nests, thatch, granaries and mills, and other similar habitats. An " earlier " and a " later " instar were described by Butler (1923).

Ova.—Unknown.

Nymphs.—Fifth instar : 3·8 mm. long ; pale yellow-brown, densely punctate with darker brown ; rostrum yellow-brown, antennae mainly yellow-brown, segment I and apex of II darker. Head an equilateral triangle, thorax and abdomen together a broad oval, strongly flattened dorso-ventrally, particularly at lateral margins. When distended by body contents, wing rudiments often indented halfway along lateral margin at a patch of thinner cuticle. Antennal segments III and IV very thin, with long erect setae ; antennae slightly shorter than extended rostrum. *Third and fourth instars* : slightly paler than fifth.

VII. Key to Known Eggs of Anthocoridae.

(1) Surface of egg with raised polygonal reticulated sculpturing, deepest near operculum . . . . . **Xylocoris cursitans** (Fallén)

– Surface of egg shining, not sculptured, though with faint polygonal markings . . . . . (2)

(2) Opercular sculpturing arranged in a central area of smaller follicular pits surrounded by a single ring of larger pits. (Habitats various, not conifers) . . . . . (3)

– Opercular sculpturing hidden by peripheral rim of chorion, or very deep, not radially symmetrical. (Habitat, conifers) . . . . . (9)

(3) Outer ring of follicular pits one third or more of radius of operculum . (4)

– Outer ring up to a quarter of radius of operculum . . . . . (7)

(4) Length 0·825 mm. or over ; peripheral rim of chorion narrow ; sculpturing coarse, irregular . . . . . (5)

– Length 0·75 mm. or less ; peripheral rim of chorion approximately half as wide as outer ring of follicular pits ; sculpturing finer, more regular . . . . . (6)

(5) Length 0·85 mm. ; egg stouter ; follicular pits of outer ring half radius, numbering 25–30 ; pits of central area 12–15 **Anthocoris gallarum-ulmi** (Degeer)

– Length 0·825 mm. ; egg more slender ; follicular pits of outer ring one-third radius, numbering 40–50 ; pits of central area 20–30 **Anthocoris nemorum** (L.)

(6) Length 0·75 mm.; outer ring of follicular pits regular in shape and size . . . . . **Anthocoris confusus** (Reuter)
– Length 0·65 mm.; outer ring of follicular pits irregular in shape and size . . . . . **Anthocoris nemoralis** (Fabricius)
(7) Peripheral rim of chorion narrow; central area almost flat **Anthocoris sarothamni** (Douglas and Scott)
– Peripheral rim of chorion broad; central area strongly convex . . (8)
(8) Peripheral rim of chorion curved inwards over operculum; central area more strongly convex; follicular pits less distinct in middle owing to general thickening . . . . . **Orius niger** (Wolff)
– Peripheral rim of chorion erect, not curved inwards; central area less strongly domed; follicular pits distinct . . **Orius majusculus** (Reuter)
(9) Surface of operculum concealed by peripheral rim of chorion; radially symmetrical . . . . . **Acompocoris pygmaeus** (Fallén)
– Surface of operculum deeply sculptured; imperfectly bilaterally symmetrical; resembles distorted honeycomb **Elatophilus nigricornis** (Zetterstedt)

VIII. Keys to Nymphs of Anthocoridae.

First instars

(1) Segments III and IV of antennae much thinner than I and II, clothed with long erect setae . . . . . (2)
– Segments III and IV not markedly thinner than I and II, pubescence shorter, not erect . . . . . (3)
(2) Bright red. . . . . **Xylocoris cursitans** (Fallén)
– Pale yellow . . . . . **Lyctocoris campestris** (Fabr.)
(3) Rostrum when extended forwards longer than antennae by at least half length of apical segment. (Habitat, conifers) . . . . . (4)
– Rostrum not longer than antennae. (Habitat, various) . . . . . (5)
(4) Rostrum longer than antennae by entire length of apical segment; colour pinkish to dusky-orange; legs and antennae uniformly coloured . . . . . **Acompocoris pygmaeus** (Fallén)
– Rostrum longer than antennae by half length of apical segment; colour pale yellow; apical segments of rostrum and antennae, and tarsi, darker . . . . . **Elatophilus nigricornis** (Zett.)
(5) Colour mainly red . . . . . (6)
– Colour not mainly red . . . . . (7)
(6) Length 1·3 mm.; meso- and metanota pale yellow, rest of body bright red; antennal segment IV red, I to III pale yellow **Anthocoris nemorum** (L.)
– Length 1·0 mm.; body entirely pale blood red; antennae uniformly pale yellow . . . . . **Cardiastethes fascii-ventris** (Garbiglietti)
(7) Length less than 0·9 mm.; colour uniform with only dorsal abdominal scent glands pale yellow or orange yellow . . . . . (8)
– Length over 1·0 mm.; colour pale yellow, more or less tinged with orange on antennae, head and abdomen . . . . . (9)
(8) Pale orange-yellow . . . . . **Orius niger** (Wolff)
– Yellowish-white . . . . . **Orius majusculus** (Reuter)
(9) Length over 1·5 mm.; body only slightly tinged with orange **Anthocoris gallarum-ulmi** (Degeer)
– Length 1·0–1·2 mm.; body tinged with orange, least in **Anthocoris confusus** (Reuter), most in **A. sarothamni** (Douglas and Scott,) intermediate in **A. nemoralis** (Fabr.)

Fifth instars

(1) Antennae with last two segments less than half thickness of basal segments, clothed with long erect setae . . . . . (2)
– Antennae with last two segments not or only slightly thinner than basal segments, pubescence shorter, not erect . . . . . (3)
(2) Length (rostrum extended) 3·5 mm. or more ; colour yellow-brown to brown . . . . . **Lyctocoris campestris** (Fabricius)
– Length 2·9 mm. or less ; bright red . . . **Xylocoris cursitans** (Fallén)
(3) Colour mainly blood red . . . **Cardiastethes fascii-ventris** (Garbiglietti)
– Colour various, not mainly red . . . . . (4)
(4) Rostrum longer than antennae by length of its apical segment when extended . . . . . **Acompocoris pygmaeus** (Fallén)
– Rostrum not distinctly longer than antennae, often shorter . . . (5)
(5) Shorter, length to breadth ratio 2·7 : 1 ; legs, rostrum and antennae pale yellow . . . . . (6)
– Longer, length to breadth ratio 3·3 : 1 ; legs, rostrum and antennae at least partly dark or dusky . . . . . (7)
(6) Length 2·1 mm. approximately ; all angles of pronotum with a single long erect seta . . . . . **Orius niger** (Wolff)
– Length 2·7 mm. approximately ; pronotum without such bristles **Orius majusculus** (Reuter)
(7) Abdomen scarcely longer than breadth, broadly rounded posteriorly, hind margins of first two segments narrowly white ; antennae and rostrum entirely dark brown to black **Elatophilus nigricornis** (Zetterstedt)
– Abdomen distinctly longer than breadth, tapering posteriorly, first two segments slightly paler than rest ; antennae and rostrum not usually entirely dark . . . . . (8)
(8) Wing rudiments distinctly paler at apices . . . . . (9)
– Wing rudiments not paler at apices . . . . . (12)
(9) Posterior angles of pronotum distinctly paler ; length of insect 3·7–4·2 mm.. . . . . (10)
– Posterior angles of pronotum not paler ; length, 3·0–3·5 mm., or over 4·4 mm. . . . . (11)
(10) Antennae as long as greatest width of abdomen, segments II and III largely pale, I and IV dark ; abdomen very glossy with few setae ; femur pale at apex, tibia dark at base and apex, tarsi dark at apex **Anthocoris nemorum** (L.)
— Antennae shorter than width of abdomen, all segments pale only at apices ; abdomen shining, but not glossy, sparsely pubescent ; legs mainly dusky, with apices of tibiae and bases of tarsi sometimes slightly paler . . . . . **Anthocoris nemoralis** (Fabr.)
(11) Length 3·0–3·5 mm. . . . . **Anthocoris confusus** (Reuter)
— Length more than 4·0 mm. . . . **Anthocoris gallarum-ulmi** (Degeer)
(12) Length more than 4·0 mm. . . . . **Anthocoris gallarum-ulmi** (Degeer)
— Length 3·0–3·5 mm. . . . . (13)
(13) Legs and antennae entirely dark, apart from extreme apices of antennal segments ; entire insect dark greenish-brown to greenish-black. Habitat, Broom . . . . **Anthocoris sarothamni** (Douglas and Scott)
— Legs yellow-brown ; antennae, segment I dark, II dusky at base and apex or apex only, III basal half pale, apical half dark, IV entirely dark ; entire insect not darker than dark brown. Habitat, variable, not known to occur on Broom . . . . **Anthocoris confusus** (Reuter)

IX. Summary.

The immature stages of twelve species of British Anthocoridae (Hemiptera, Heteroptera) are described and illustrated, and keys to the eggs and first and fifth instar nymphs are given.

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